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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,210	05/07/2001	Steven J. Harrington	D/98258	3224

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Rochester, NY 14644

EXAMINER

THOMPSON, JAMES A

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/851,210

Applicant(s)

HARRINGTON, STEVEN J.

Examiner

James A. Thompson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Re-opening of Prosecution after Appeal Brief

1. In view of the Appeal Brief filed on 29 December 2005, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

David K. Moore



**DAVID MOORE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600**

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 recites "tessellating the available color space as defined by the redundant color inks into regions where the regions are arranged so as to minimize the range of luminance variation found within the regions." Claim 8 recites "tessellating the color space so as to minimize luminance variation in the redundant color inks utilized."

A color space is simply a multi-dimensional mathematical representation of the colors that are available for a color image reproduction device. Tessellating said color space is simply partitioning the said multi-dimensional mathematical representation into a plurality of regions. Thus, claims 1 and 8 merely recite the manipulation of a data structure, which is non-statutory. The methods recited in claims 1 and 8 do not therefore produce a useful, concrete and tangible result.

Furthermore, claims 1 and 8 are directed to an abstract idea, namely that of tessellating an available color space to minimize luminance variation, and thus pre-empts any other possible ways in which a color space may be tessellated so as to minimize luminance variation in the redundant color inks utilized that have not been disclosed in the present specification, but may be discovered in the future.

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For the above reasons, claims 1 and 8, along with claims 2-7 and claims 9-12 which respectively depend from claims 1 and 8, are non-statutory.

4. Claims 13-16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 13 recites a method of tessellating, sorting and connecting redundant color inks in an available color space. A color space is simply a multi-dimensional mathematical representation of the colors that are available for a color image reproduction device. Tessellating said color space is simply partitioning the said multi-dimensional mathematical representation into a plurality of regions. The steps of sorting and connecting the redundant color inks in the color space are simply manipulations of the thus partitioned color space regions. Thus, claim 13 merely recites the manipulation of a data structure, which is non-statutory. The method recited in claim 13 does not therefore produce a useful, concrete and tangible result. Claim 13, along with claims 14-16 which depend from claim 13, are therefore non-statutory.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 1 recites the limitation "the available color space" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-5 and 7-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Hirokazu (US Patent Application Publication 2001/0028471 A1).

Regarding claim 1: Hirokazu discloses tessellating the available color space (figure 2 and para. 43 of Hirokazu) as defined by the redundant color inks (CMYK) (para. 21, lines 1-5 of Hirokazu) into regions (figure 2(61,62,63,64,65) of Hirokazu) where the regions are arranged so as to minimize the range of luminance variation found within the regions (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu). The available color space is partitioned (and thus tessellated) into regions (figure 2(61,62,63,64,65) of Hirokazu) based on lightness (L^*) and color (a^* and b^*) values (figure 2 and para. 43 of Hirokazu), which are derived from redundant color inks (CMYK) (para. 21, lines 1-5 of Hirokazu). Since the partitioned regions are arranged

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based on constant values of L^* (and thus a variation of zero) (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu), the regions are therefore arranged so as to minimize the range of luminance variation found within the regions. CMYK is a set of redundant color inks since, as is well known in the art, cyan, magenta and yellow (CMY) are of themselves sufficient to fully specify the color space. As is well-known in the art, black (K) is redundantly used in color ink printing so that a minimum amount of ink is placed on the print medium, and since black ink is cheaper than color ink.

Regarding claim 2: Hirokazu discloses overlaying the tessellated color space result from the prior tessellating step with interpolation points so as to create an overlay lookup table (para. 28, lines 7-12 of Hirokazu).

Regarding claim 3: Hirokazu discloses applying image data to the overlay lookup table to point to which redundant color inks to select (para. 35 of Hirokazu) and provide the amounts to use of the selected redundant color inks (para. 34 of Hirokazu).

Regarding claim 4: Hirokazu discloses that the regions are arranged so that region boundaries are predominantly orthogonal to the axis of luminance (figure 2 and para. 42, lines 8-12 of Hirokazu). Since the regions are arranged purely with respect to increasing L^* values (figure 2 and para. 42, lines 8-12 of Hirokazu), then the region boundaries are orthogonal to the axis of luminance.

Regarding claim 5: Hirokazu discloses that the amounts are interpolated from the interpolation points stored in the overlay lookup table (para. 28, lines 7-12 of Hirokazu).

Regarding claim 7: Hirokazu discloses that the regions are non-overlapping (figure 2 and para. 42, lines 8-12 of Hirokazu).

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Since the regions are each at separate, constant values of L^* (figure 2 and para. 42, lines 8-12 of Hirokazu), the regions cannot overlap.

Regarding claim 8: Hirokazu discloses tessellating the color space (figure 2 and para. 43 of Hirokazu) so as to minimize luminance variation (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu) in the redundant color inks (CMYK) used (para. 21, lines 1-5 of Hirokazu). The color space is partitioned (and thus tessellated) into regions (figure 2(61,62,63,64,65) of Hirokazu) based on lightness (L^*) and color (a^* and b^*) values (figure 2 and para. 43 of Hirokazu), which are derived from redundant color inks (CMYK) (para. 21, lines 1-5 of Hirokazu). Since the partitioned regions are arranged based on constant values of L^* (and thus a variation of zero) (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu), the regions are therefore arranged so as to minimize the luminance variation found within the regions. CMYK is a set of redundant color inks since, as is well known in the art, cyan, magenta and yellow (CMY) are of themselves sufficient to fully specify the color space. As is well-known in the art, black (K) is redundantly used in color ink printing so that a minimum amount of ink is placed on the print medium, and since black ink is cheaper than color ink.

Regarding claim 9: Hirokazu discloses sorting the redundant color inks by order of luminance from the darkest to the lightest (figure 2 and para. 42, lines 8-12 of Hirokazu). From right to left, the redundant color inks, which are converted into CIELab color space (para. 37-38 of Hirokazu), are sorted in order of luminance from the darkest ($L^* - 2\Delta L$) to the

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lightest ($L^* + 2\Delta L$) (figure 2 and para. 42, lines 8-12 of Hirokazu).

Regarding claim 10: Hirokazu discloses that the regions are non-overlapping (figure 2 and para. 42, lines 8-12 of Hirokazu). Since the regions are each at separate, constant values of L^* (figure 2 and para. 42, lines 8-12 of Hirokazu), the regions cannot overlap.

Regarding claim 11: Hirokazu discloses overlaying the tessellated color space with interpolation points so as to create an overlay lookup table (para. 28, lines 7-12 of Hirokazu).

Regarding claim 12: Hirokazu discloses applying image data to the overlay lookup table to point to which redundant color inks to select (para. 35 of Hirokazu) and provide the amounts to use of the selected redundant color inks (para. 34 of Hirokazu).

Regarding claim 13: Hirokazu discloses tessellating the color space (figure 2 and para. 43 of Hirokazu) so as to minimize luminance variation (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu) in the redundant color inks (CMYK) (para. 21, lines 1-5 of Hirokazu). The color space is partitioned (and thus tessellated) into regions (figure 2(61,62,63,64,65) of Hirokazu) based on lightness (L^*) and color (a^* and b^*) values (figure 2 and para. 43 of Hirokazu), which are derived from redundant color inks (CMYK) (para. 21, lines 1-5 of Hirokazu). Since the partitioned regions are arranged based on constant values of L^* (and thus a variation of zero) (para. 42, lines 7-12 and para. 44, lines 1-7 of Hirokazu), the regions are therefore arranged so as to minimize the luminance variation found within the regions. CMYK is a set of redundant color inks since, as is well known in the art, cyan, magenta and yellow

(CMY) are of themselves sufficient to fully specify the color space. As is well-known in the art, black (K) is redundantly used in color ink printing so that a minimum amount of ink is placed on the print medium, and since black ink is cheaper than color ink.

Hirokazu further discloses that said tessellating is utilized by sorting the redundant color inks by order of luminance from the darkest to the lightest (figure 2 and para. 42, lines 8-12 of Hirokazu); and connecting the redundant color inks in the sorted order across the color space so as to create tetrahedral non-overlapping tessellated regions (figure 2 and para. 42, lines 8-12 of Hirokazu). From right to left, the redundant color inks, which are converted into CIELab color space (para. 37-38 of Hirokazu), are sorted in order of luminance from the darkest ($L^* - 2\Delta L$) to the lightest ($L^* + 2\Delta L$) (figure 2 and para. 42, lines 8-12 of Hirokazu). Furthermore, the regions are defined by a constant L^* value, a range of a^* values, and a range of b^* values, which form a four-sided region (such as figure 2(61) of Hirokazu), and thus a tetrahedron. Since the tetrahedral regions are each at separate, constant values of L^* (figure 2 and para. 42, lines 8-12 of Hirokazu), the tetrahedral regions cannot overlap.

Regarding claim 14: Hirokazu discloses overlaying the tessellated color space with interpolation points so as to create an overlay lookup table (para. 28, lines 7-12 of Hirokazu).

Regarding claim 15: Hirokazu discloses applying image data to the overlay lookup table to point to which redundant color inks to select (para. 35 of Hirokazu) and provide the amounts to use of the selected redundant color inks (para. 34 of Hirokazu).

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Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirokazu (US Patent Application Publication 2001/0028471 A1) in view of Ng (US Patent 5,185,661).

Regarding claim 6: Hirokazu does not disclose expressly that the interpolation is performed by calculating the volume of tetrahedra formed by the interpolation points.

Ng discloses that interpolation is performed by calculating the volume of tetrahedra formed by the interpolation points (figure 4 and column 5, lines 16-24 of Ng).

Hirokazu is analogous art since it is from the same field of endeavor as the present application, namely the tessellation and organization of a color space in a digital color image data reproduction system (figure 2 and figure 4 of Hirokazu). Hirokazu and Ng are combinable because they are from the same field of endeavor, namely color mapping and conversion of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to perform interpolation by specifically calculating the volume of tetrahedra formed by the interpolation points, as taught by Ng. The suggestion for doing so would have been such interpolation based on the eight surrounding points and the associated volume

is well-known (column 5, lines 19-22 of Ng), and thus readily applied and accurate. Therefore, it would have been obvious to combine Ng with Hirokazu to obtain the invention as specified in claim 6.

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirokazu (US Patent Application Publication 2001/0028471 A1) in view of Kasson (US Patent 5,390,035).

Regarding claim 16: Hirokazu discloses compensating for the convexity or concavity of the tessellated regions (para. 35 of Hirokazu).

Hirokazu does not disclose expressly that, if creating a tetrahedral non-overlapping tessellated region results in a concave shape, then additional tetrahedral non-overlapping tessellated regions are added to fill the cavity and maintain a convex construction.

Kasson discloses that, if creating a tetrahedral non-overlapping tessellated region results in a concave shape, then additional tetrahedral non-overlapping tessellated regions are added to fill the cavity and maintain a convex construction (figure 7 and column 14, lines 3-9 of Kasson). The tetrahedra are generated using a volume packing technique which minimizes distortion of the domain space (column 14, lines 3-6 of Kasson). Figure 7 of Kasson shows that an overall convex shape is maintained for the domain space. Further, since the domain space is packed with octahedra that are in turn packed with tetrahedra (column 14, lines 6-9 of Kasson), then a convex shape will inherently be maintained owing to the convex shape of an octahedron.

Hirokazu and Kasson are combinable because they are from the same field of endeavor, namely the tessellation and organization of a color space in a digital color image data reproduction system. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to include additional tetrahedral non-overlapping tessellated regions to maintain a convex construction, as taught by Kasson. The motivation for doing so would have been minimize the distortion of the domain space (column 14, lines 3-6 of Kasson). Therefore, it would have been obvious to combine Kasson with Hirokazu to obtain the invention as specified in claim 16.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Lin et al, US Patent 6,421,142 B1, Patented 16 July 2002, Filed 07 January 1999.
- b. Vigneau et al, US Patent 6,008,907, Patented 28 December 1999, Filed 15 October 1997.
- c. Zhongjie Liang, US Patent 5,579,031, Patented 26 November 1996, Filed 14 February 1995, Continuation of application filed 15 December 1992.
- d. Decker et al, US Patent 6,137,596, Patented 24 October 2000, Filed 10 August 1999, Division of application filed 25 August 1997.
- e. Shijie J. Wan, US Patent 5,704,026, Patented 30 December 1997, Filed 13 January 1997, Continuation of application filed 28 May 1993.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



21 March 2006

James A. Thompson
Examiner
Tech Division 2625



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